Charles Clark

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Education

Stony Brook University **Stony Brook, New York**
M.Sc. Materials Science & Engineering, *GPA: 3.97/4.00* August 2021 - May 2023
Thesis: *Synchrotron X-ray Data Processing & Visualization Techniques for Analysis of Functional Materials*

Stony Brook University **Stony Brook, New York**
B.E. Engineering Science, *summa cum laude* August 2017 - May 2021
Specialization: Electronics Engineering

Work Experience

University of Stuttgart **Stuttgart, Germany**
Research Assistant, Computational Imaging Systems (CIS) August 2023 - August 2024

- Implemented and trained computer vision neural network architectures using *PyTorch*, and applied models to sparse-sampled computed tomography (CT) artifact correction.
- Used *slurm* workload manager to utilize high-performance GPU computing clusters for parallelization of neural network model training and prediction.
- Created a CT scan simulation pipeline using *Tcl* scripting language and Artist CT simulation software to generate training and test data for neural networks.
- Co-conducted beamtime experiments at the Beamline for Hierarchichal Phase Contrast Tomography (BM18) of the European Synchrotron Radiation Facility (ESRF) for multispectral CT imaging using silicon prism arrays.
- Co-developed a CT image segmentation algorithm for tracking pore growth in welded metals using *scikit-image*, *OpenCV* and other scientific Python packages for implementation, and presented the technique at the 13th International Conference on Industrial Computed Tomography (iCT2024).

Brookhaven National Lab **Upton, New York**
Software Development & Data Analysis Intern August 2022 - May 2023

- Collaborated with beamline scientists and software engineers at National Synchrotron Light Source II (NSLS-II) to develop and deploy synchrotron data analysis and visualization software.
- Created web application for visualization and analysis of X-ray absorption spectroscopy (XAS) data, using Dash framework for GUI and scientific Python packages for back-end data analysis.
- Integrated web application with Tiled, a data access service built on the Bluesky framework, for ease of access to synchrotron data from MongoDB databases.
- Analyzed the effectiveness of machine learning-based outlier detection algorithms on X-ray spectroscopy datasets using *scikit-learn*.
- Developed and deployed a pipeline for automatic reduction and calibration of X-ray emission spectroscopy (XES) images recorded using von Hamos spectrometer.

Stony Brook University **Stony Brook, New York**
Graduate Research Assistant, Chen-Wiegart Group August 2021 - August 2022

- Collaborated with PhD students and beamline scientists to perform synchrotron X-ray experiments from sample preparation to data analysis and writing results. Made significant contributions in several projects for co-authorship in published results.

- Performed an in-depth study of state-of-the-art methods for analysis and visualization of synchrotron X-ray experimental data.
- Used multivariate curve results alternating least squares (MCR-ALS) algorithm to perform spectral decomposition analysis for a study of phase evolution in MnO_2/Zn battery electrodes.
- Utilized Python-based image processing packages to perform quantitative analysis of porosity growth during an in-situ study of Ni–Cr alloy dealloying in molten salt environments.
- Conducted beamtime experiments at NSLS-II including XAS at the Beamline for Materials Measurement (BMM, 6-BM), XRD at the X-ray Powder Diffraction beamline (XPD, 28-ID-2), and nano-tomography at the Full-field X-ray Imaging beamline (FXI, 18-ID).

Skills

Programming & Software Engineering

Programming Languages: Python (Proficient), C++ (Intermediate), JavaScript (Beginner)

Web Development: HTML, CSS, React, Dash

Data Analysis: Pandas, NumPy, SciPy, Matplotlib, Plotly

Machine Learning: PyTorch, scikit-learn

Image Processing: OpenCV, Fiji, scikit-image

Software Development: Git, Linux, CMake

Materials Science

Characterization Techniques: Scanning Electron Microscopy (SEM), Optical Microscopy, X-ray Diffraction (XRD), X-ray Absorption Spectroscopy (XAS), Computed Tomography (Lab CT and Synchrotron-based)

Sample Preparation: Thin-film Sputter Deposition, Heat Treatment, Vacuum Systems, Electrolyte & Electrode Preparation

Publications

Manuel Buchfink, Faizan Ahmad, Guangpu Yang, Ammar Alsaffar, Charles Clark, Ahmed Baraka, Xingyu Liu, and Sven Simon. Compensating sparse-view inline computed tomography artifacts with neural representation and incremental forward-backward network architecture. 14th Conference on Industrial Computed Tomography (iCT), 4 - 7 February 2025, Antwerp, Belgium. *e-Journal of Nondestructive Testing*, 30(2), 2025.

Xingyu Liu, Charles Clark, Steffen Kieß, Ammar Alsaffar, Hieu Tran, Guhathakurta Jajnabalkya, and Sven Simon. Artifact-robust object segmentation using thresholding based on binarized image object analysis (TB2IOA) in X-ray computed tomography. 13th Conference on Industrial Computed Tomography (iCT), 6 - 9 February 2024 in School of Engineering, Wels Campus, Austria. *e-Journal of Nondestructive Testing*, 2024.

Chonghang Zhao, Lin-Chieh Yu, Kim Kisslinger, Charles Clark, Cheng-Chu Chung, Ruipeng Li, Masafumi Fukuto, Ming Lu, Jianming Bai, Xiaoyang Liu, Hui Zhong, Mingzhao Liu, Sanjit Ghose, and Yu-chen Karen Chen-Wiegart. Kinetics and evolution of solid-state metal dealloying in thin films with multimodal analysis. *Acta Materialia*, 242:118433, 2023.

Varun R. Kankanallu, Xiaoyin Zheng, Denis Leshchev, Nicole Zmich, Charles Clark, Cheng-Hung Lin, Hui Zhong, Sanjit Ghose, Andrew M. Kiss, Dmytro Nykypanchuk, Eli Stavitski, Esther S. Takeuchi, Amy C. Marschilok, Kenneth J. Takeuchi, Jianming Bai, Mingyuan Ge, and Yu-chen Karen Chen-Wiegart. Elucidating a dissolution–deposition reaction mechanism by multimodal synchrotron X-ray characterization in aqueous Zn/MnO_2 batteries. *Energy Environ. Sci.*, 16:2464–2482, 2023.

Cheng-Chu Chung, Charles Clark, Chonghang Zhao, Kim Kisslinger, Fernando Camino, Dmytro Nykypanchuk, Hui Zhong, Sanjit Ghose, Ruipeng Li, Chang-Yong Nam, and Yu-chen Karen Chen-Wiegart. Oxidation driven thin-film solid-state metal dealloying forming bicontinuous nanostructures. *Advanced Materials Interfaces*, 10(35):2300454, 2023.

Lin-Chieh Yu, Charles Clark, Xiaoyang Liu, Arthur Ronne, Bobby Layne, Phillip Halstenberg, Fernando Camino, Dmytro Nykypanchuk, Hui Zhong, Mingyuan Ge, Wah-Keat Lee, Sanjit Ghose, Sheng Dai, Xianghui Xiao, James F. Wishart, and Yu-chen Karen Chen-Wiegart. Evolution of micro-pores in Ni–Cr alloys via molten salt dealloying. *Scientific Reports*, 12(1):20785, Dec 2022.